4.0 Contributing Factors

Numerous point and nonpoint sources of pollution contribute to surface water quality conditions and trends; these factors are collectively called "contributing factors". Point sources discharge from a pipe or a ditch and include DEP regulated facilities (i.e., require operating permits). Nonpoint sources of pollution emanate from diffuse sources that are often dispersed and difficult to control. Factors that contribute to water quality concerns (i.e., both point and nonpoint sources) are summarized in Table 4-1.

Water Quality Contributing Factors: Point sources emanate from a pipe and include industrial and municipal wastewater treatment plant effluents, cooling water discharges and industrial stormwater. Industrial and municipal discharges to surface and ground water are regulated through permits. Nonpoint sources of pollution emanate from diffuse sources that are often dispersed and difficult to control. Nonpoint sources of pollution include municipal stormwater and contaminated runoff from construction, urban, suburban, agricultural lands, golf courses, waste disposal, contaminated sites, small septic systems, aquatic pesticide applications, sediment fluxes and air deposition. In New Jersey, municipal stormwater is categorized as a type of nonpoint source pollution even though it is discharged from a pipe because nonpoint sources pollute municipal stormwater. Naturally occurring radon affects ground water used for potable supplies, poor quality of some surface and ground water sources affects potable supplies and water treatment costs. In addition, naturally occurring and anthropogenic total organic carbon contributes to trihalomethane formation in drinking water from surface sources. Multi-media transfer of pollutants occurs as a result of physical and chemical processes, air deposition to lakes and land, hydraulic connections between ground and surface water, pollutant transfer between water, sediment, and biota contribute to water quality concerns.

Nonpoint sources within WMA 02 may include stormwater and runoff from developed or disturbed lands; contaminated sites; improperly placed or malfunctioning septic systems; atmospheric deposition; landfill runoff and leachate. Figure 4.0-1 locates the point source dischargers in WMA 02, land uses and areas of total phosphorus exceedances (i.e., exceed SWQSs). It also identifies point and non-point sources and their areas of influence. Physical, chemical and ecological processes can transport toxics, nutrients and pathogens to surface water, ground water, sediments and plants and animals.

Water Quantity Contributing Factors: Water quantity can affect water quality in various ways but primarily through flow (i.e. scour) and volume changes (i.e., dilution/concentration) both on a geographically distributed (e.g., high ridge vs. valley gradients) and a seasonal basis (e.g., spring floods, summer droughts). Factors that contribute to water quantity concerns include: increasing demands in WMA 02 for water as population increases; current and future water demand pressures external to WMA 02; decreased recharge as development occurs; balancing water supply and ecological considerations, especially during dry conditions; and water quality degradation. In addition, future TMDL decisions may affect water management measures such as minimum passing flow requirements.

Table 4.0-1: Water Quality Concerns and Contributing Factors

Concern	Surface Water Quality	Ground Water Quality	Drinking Water Quality
Nutrients	Domestic sewage effluent Municipal stormwater Runoff Sediment flux Air deposition Contaminated groundwater	Septic systems Municipal stormwater Infiltration	Source water quality degradation
Pathogens	Municipal stormwater Runoff Domestic/ wild animals Sediment flux Environmental regrowth Domestic sewage effluent	**Not identified as a GW issue	**Not identified as a DW issue
Suspended Sediment	Runoff Erosion Dredging?	**Not identified as a GW issue	**Not identified as a DW issue
Salts	Domestic sewage effluent Municipal stormwater Runoff Industrial effluent?	**Not identified as a GW issue	**Not identified as a DW issue
Metals	Industrial effluent Domestic sewage effluent Municipal stormwater Runoff Industrial stormwater? Sediment flux Air deposition	**Not identified as a GW issue	**Not identified as a GW issue
Organics	**Not identified as a SW issue	Contaminated sites Septic systems Contaminated surface water?	Source water quality degradation (VOCs in GW; TOC in SW)
Radon	**Not identified as a SW issue	Naturally occurring	Naturally occurring in GW sources
Benthic Impairment	Poor surface water quality Poor sediment quality Poor habitat quality Natural conditions	NA	NA
Fish Tissue Contamination	Poor sediment quality Air deposition	NA	NA
Sediment Quality	Historical discharges, spills Air deposition Current discharges, spills Contaminated groundwater		

4.1 Point Sources in WMA 02

As of December1996 there were 16 regulated point sources (i.e., existing NJPDES Permitted discharges.) in WMA 02 that discharged treated wastewater to surface water (See Figure 4.1-1). Regulated point source discharges are further broken down into major and minor facility types (Table 4.1-1) including:

- 9 municipal wastewater permits: typically a combination of municipal and industrial wastewater;
- 5 industrial wastewater/industrial stormwater permits;
- 1 petroleum clean-up permit; and
- 1 non-contact cooling water permit.

On December 26, 1996, the flow to the Sussex Boro STP (Papakating Creek) was re-routed to the Sussex County MUA (Wallkill River) for treatment. Even though this discharge was terminated and the flow routed to another plant, the facility was active during the time the water quality trends were monitored and therefore is included in the discussion and located on the maps. These facilities are regulated by effluent limitations specific to the type of facility, the type discharge, or if necessary as a means to protect site specific water quality. For example, all municipal treatment plants at a minimum are regulated for oxygen demanding substances, total suspended solids, pH, oil and grease and fecal coliform. Effluent flow is usually monitored.

There is also one closed solid waste landfill (SWL) in WMA 02 and no other solid waste facilities (e.g., composting or recycling Facilities).

4.1.1 Point Source Compliance (Placeholder)

Information on permitting and enforcement actions for permitted facilities are reported annually by NJDEP in the Clean Water Enforcement Act Report. None of the dischargers in WMA 2 have been identified as being in Significant Non-compliance (SNC). A facility may be identified as SNC when it violates a permit limitation by 40% twice in a six-month period. For all facilities located in WMA 2, there have been a total of 3 fecal coliform violations and 2 total phosphorus violations during the period 1991 to 1999. Permit violations are summarized in Table 4.1-2.

4.2 Non Point Sources in WMA 02

Increasing urban development (Figure 2.3-2) and population densities (See Figure 2.4-1) in certain areas of WMA 02 and the conversion of summer homes to year-round dwellings can result in localized nonpoint source contamination from home and road construction (e.g., suburban runoff, septic leachate, etc.). In addition agricultural runoff may act as a non-point source of pollution (See Figure 2.3-1) as much of the agricultural lands are along the stream corridors. Some areas in WMA 02 have been experiencing runoff associated with suburban land development including housing construction site runoff, suburban surface runoff, as well as winter road salting.

Nonpoint sources have also contributed to eutrophication in many of the lakes in WMA 02. Although the Department has identified only two lakes as eutrophic, Clove

Lake and Wawayanda Lake (Figure 3.3-3), there are numerous private lakes throughout WMA 2 which are experiencing some eutrophication. The Department does not receive data for these lakes and therefore does not list them as being eutrophic. However, there are Lake Management programs in effect for many of these lakes which infers that they are experiencing some eutrophication. Septic systems may also be a source of nutrients and/or fecal coliform. Much of the development that is clustered around lakes is not located in a sewer service area (Figure 4.2-1).

4.2.1 Land Use Sources

Forested area comprises the main landuse (57%) in WMA 02 (Figure2.3-1). Forested lands can be associated with fecal coliform contamination (i.e., from wildlife) and possible sedimentation effects dependant on what types of forestry and management practices are employed industries (e.g., timber harvest, lumberyards, paper pulping, etc.). Agriculture is the second highest landuse (21%). It is not possible at this time to differentiate between types of agriculture (i.e., row crops, pasture or dairy herd) and the type of pesticides applied in WMA 02 agricultural areas are those usually associated with fruit and vegetable crops. Agriculture can be associated with non-point sources of pollution (e.g., nutrients from fertilizers, toxics from pesticides, coliforms from farm animals). In WMA 02 which straddles the Highlands - Ridge and Valley Physiographic Provinces represented by high topographic relief (Figure 2.1-3), these agricultural areas tend to follow tillable river valleys (Figure 2.3-1) that are in close contact with surface waters.

There also exist built or urban land areas that cluster along stream corridors and around lakes throughout WMA 02 (See figure 2.4-1). These built lands include urban, suburban, industrial and commercial uses. Land development contributes to nutrient and toxic contamination from municipal stormwater and runoff, septic systems and higher flows at municipal treatment plants.

4.2.2 Stormwater Sources

Stormwater and runoff also negatively affects stream hydrology and aquatic habitat through erosion, flooding, and loss of healthy stream bed and corridor structure and ecological communities.

4.2.3 Impervious Surfaces

The amount and location of impervious surface coverage can be used to indicate potential water quality problems caused by patterns of land development. Pollution and reduced ground water recharge begin to occur when 12 to 17% of the land surface is covered by impervious surfaces. Impervious surface cover analyses for watersheds in New Jersey and WMA 02 are being developed and will be available in 2000.

4.3 Wallkill River

4.3.1 Point Sources of Pollution

In the past, the Wallkill River had poorer water quality in the warm weather months, leading to the conclusion that point or continuous sources may be (or have been) significant contributors to stream degradation. There are presently 10 NJPDES permitted dischargers in the Wallkill River (Figure 4.1-1), five of which are municipal sanitary discharges. Three municipal minor dischargers do not have phosphorus limits at this time. Two of these dischargers will be eliminated in the near future as the flow from the Sparta Twp. BOE's high school and middle school are sent to Sussex County MUA for treatment. For the three facilities with permit limitations (1mg/l), there have been only two violations in the period 1991-1999 (Table 4.1-2).

Nonpoint Sources of Pollution

Urban landuse has been increasing (see Figure 2.3-2). In the Upper Wallkill River, deleterious effects of both urbanization and agricultural activities are on the rise. Several golf courses are located along the Wall Kill, which could be a source of pesticides and nutrients. (Figure 4.0-1) Increasing construction and urban surface runoff have resulted in sediment loading and stormwater contamination, respectively. The Lower Wallkill River is also experiencing the effects of increased urbanization - largely in the form of construction site runoff. Crop production, pasturelands, and a zinc mine at Franklin are all suspected of affecting water quality in the lower segment of the Wallkill.

4.4 Papakating Creek (Clove Brook)

4.4.1 Point Sources of Pollution

There is one monitoring station in this sub-watershed located on Papakating Creek below the confluence with Clove Brook. Surface water quality data from 1995-1997 exceeded SWQS for total phosphorus and fecal coliform. A wastewater discharge, Sussex Boro Treatment Plant, which had been under enforcement action and was suspected of causing water pollution problems, was eliminated in 1996. Flow from the Sussex Boro STP is now treated at the Sussex County MUA facility, which discharges into the Wallkill River. As mentioned in Section 3.4.1, phosphorus data showed an improvement during 1995 to 1997 over the previous 4-yr. period. (See Figure 3. 3-1) Some of this improvement may be attributed to the removal of the Sussex Boro facility. Only one discharge remains the Regency at Sussex Apt. (Figure 4.1-1) which did not have any permit violations during 1999. The Regency, however, does not monitor for total phosphorus.

4.4.2 Nonpoint Sources of Pollution

The primary source contributing to the elevated phosphorus and fecal coliform levels is agricultural, including feedlot, pastureland, and crop runoff. Feedlot runoff has been identified as the reason for the closure of bathing beaches in Clove Lake. Increasing

agricultural runoff (crop production, pastureland, and animal holding) along Papakating Creek is suspected as having contributed to eutrophic conditions in this stream.

4.5 Black Creek (Pochuck)

4.5.1 Point Sources of Pollution

There are four point source discharges to the creek: a petroleum clean up at the Mobile S/S site; municipal discharges from the Vernon Twp BOE (Lounsberry Hollow Middle School) and Legends Resort & Country Club and a cooling water discharge from Ames Rubber Company. Legends is a seasonal discharge operating from November through March and has a phosphorus limit of 1.0 mg/l. The Middle School has a limit of 0.5 mg/l. Neither facility has had any violations from 1991 to 1999 for total phosphorus or fecal coliform.

4.5.2 Nonpoint Sources of Pollution

Black Creek receives some agricultural runoff; however, its principal nonpoint source problem is believed to be suburban/urban in nature. Construction activities coupled with surface runoff are suspected in sediment loading and stormwater contamination. There are areas of dense population near streams, which are not located in a sewer service area (Figure 4.2-1).

4.6 Known Contaminated Sites in WMA 02

At present it is unclear how sites on the Department's Known Contaminated Sites List (KCSL) (Figure 4.6-1) may affect surface water quality on a watershed basis (i.e., affects may be localized requiring insitu remedial/abatement actions). Outside of the data presented here on the general complexity of site contamination there are clear digital data gaps on immediate access to important information such as the nature (i.e., contaminant) and extent (e.g. surface water, sediments) of contamination. This is due primarily to a lack of computerized information in NJDEP's Site remediation Program (SRP). This data gap is being dealt however, through the development of a digital database submittal system called EQUIS. All future site data will be readily accessible and available for assessment.

There are 97 known contaminated sites identified in WMA 02 (Table 4.6-1). These sites are managed by different elements within DEP's Site Remediation Program (SRP) based on the type of site (e.g., underground storage tank, federal facility, etc.), and the funding source for cleanup (e.g., public vs. private). These sites have been also been classified into remedial groups based on their level of complexity. The 97 known contaminated sites in WMA 02 fall into the following classifications:

C1: Single source/single contaminants affecting both soil and groundwater (52 sites);
C2: Multiple sources/contaminants affecting soil/groundwater - moderate (34 sites);
C3: Multiple sources/contaminants affecting soil/groundwater - severe (4 sites);
C4/D: Superfund –severe and complex (7 sites).

This classification of site complexity into different levels is based on the SRP's 1989 Case Assignment Manual. The intent of the remedial level determinations are to reflect the overall degree of contamination at a site recognizing that individual areas of concern may involve remedial actions of varying levels which are explained below.

Level C-1: A remedial action, which does not involve formal design where source is known/identified. May include the potential for (unconfirmed) ground water contamination. Examples of C-1 cases are regulated or unregulated storage tanks containing gas or heating oil; septic tanks etc.

Level C-2: A remedial action, which consists of a formal engineering design phase, and is in response to a known source or release. Since the response is focused in scope and address a known, presumably quantifiable source, this remedial level is of relatively shorter duration than responses at sites with higher remedial levels. Usually involves cases where ground water contamination has been confirmed or is known to be present.

Level C-3: A multi-phase remedial action in response to an unknown and/or uncontrolled source or discharge to the soils and/or ground water. In this remedial level the contamination is unquantifiable (or presumed unquantifiable) and, therefore, no determinable timeframe for the conclusion of the remedial action is known.

Level C-4/D: A multi-phase remedial action in response to multiple, unknown and/or uncontrolled sources or releases affecting multiple medium which includes known contamination of groundwater. In this remedial level the contamination is unquantifiable (or presumed unquantifiable) and, therefore, no determinable timeframe for the conclusion of the remedial action is known.

4.7 Pesticide Uses in WMA 02

Pesticide usage data are collected by DEP on a Municipal basis summarizing agricultural applications as well as applications to golf courses. These areas have been delineated in Figure 4.7-1. This data has been summarized in Tables 4.7-1 and 4.7-2. Further data analysis needs to be performed on a WMA basis. Data from pesticide use surveys conducted by NJDEP between 1993 and 1995 show that over 12,000 pounds of active pesticide ingredients were applied to land in WMA 02 annually. Approximately 4000 pounds (33%) were applied to golf courses and 8,000 pounds (66%) to agricultural lands. Tables 4.7-1 and 4.7-2 list the more common pesticides used. Although some pesticide monitoring has been conducted, the chemicals used have varied with time and those chemical monitored do not cover the full spectrum of pesticides applied. Those pesticides which have been applied and have also been monitored are identified on the Tables.